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account of it is given in *Knowledge*, for Sept. 1, 1890. The observatory of Nice was founded by M. BISCHOFFSHEIM of Paris, and he has already spent more than $1,000,000 for buildings and instruments. Among the latter is the great telescope of 30 inches aperture. The publication referred to is, I believe, also made at M. BISCHOFFSHEIM'S private cost. A brief description of the Nice Observatory will probably be printed in these *Publications* during the current year. E. S. H.

SATELLITES OF MARS, 1890.

During the present opposition the maximum theoretical brightness of the satellites of *Mars* was 1.15, if their brightness at mean opposition be taken as 1.00.*

Their brightness at discovery was 1.91. Under good circumstances they have been readily visible in the same field of view with *Mars*, when the planet was not hidden by an occulting bar. They have been several times re-discovered by visitors who were looking at the planet, and who did not know of their existence.

During April and May two observers made a conscientious search for new satellites. The weather conditions were rather unfavorable. The general conclusions reached were that no new satellite exists within the orbit of *Deimos*, which is anything like as bright as one-fourth the brightness of that satellite. It is possible, though not very likely, that so faint a satellite as this may exist outside of *Deimos*' orbit, or within that of *Phobos*. E. S. H. AND J. M. S.

SOLAR PARALLAX FROM THE TRANSIT OF VENUS PHOTOGRAPHS OF 1882.

Professor HARKNESS, U. S. N., reports that the photographs of the last transit of *Venus* (more than 1400 photographs being available) lead to the following value of the solar parallax; $\pi = 8''.842 \pm 0''.0188$. With 3963.296 miles as the equatorial radius of the earth, the resulting mean distance of the sun is 92,455,000 miles, with a probable error of 123,400 miles.—(From the *Report of the Supt. U. S. Naval Observatory*, June 30, 1889.

SPECTROGRAPHIC OBSERVATIONS OF *SPICA* AT POTSDAM.

In No. 2995 of the *Astronomische Nachrichten* Professor H. C. VOGEL considers at length all the photographs of the spectrum of α Virginis which have been made at Potsdam, and finds that they accord closely with his earlier observations of the same star, showing that it is a close binary, having a period of only a little more than four days. The same apparatus was employed as in the determination of motions of stars in the line of sight, described by Professor VOGEL in *Astronomische Nachrichten*, No. 2896. In the method followed at Potsdam, the spectrum of the star and that of terrestrial hydrogen are photographed together, and the displacement of the star lines on the photograph in the neighborhood of the Hγ line, is afterwards measured under a microscope. Stars of the second and third spectral types gave results of great accuracy, as the lines in such stars are sharp and are very numerous. In the case of α Virginis, the difficulties of observation were considerably greater, the hydrogen lines being broad and diffuse, without any definite maximum of intensity, and there were no distinct lines in the vicinity of Hγ to which the measurements could be referred.

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* *See* a paper by Mr. KEELER, in the *Astronomical Journal*, Vol. VIII, p. 74.

Measurement of twenty-four photographs, obtained during the spring of the present year, showed that the star lines were displaced alternately toward the upper and the lower end of the spectrum in a complete period of about four days, the maximum displacement toward the violet indicating a motion of the star toward the sun of 65.9 English miles, and that toward the red a receding motion of 47.5 miles per second. These observations are completely explained by supposing that *Spica* is a binary star having a period of about four days, the orbital velocity of the larger component being 56.7 miles per second, and that the system is approaching the sun at the rate of 9.2 miles per second. The more exact elements, as determined by Professor VOGEL, are as follows:

Potsdam Mean Time.

Epoch t_0 (no orbital motion in line of sight) = 1890, May $4^d\ 10^h.\ 50$. Period $p = 4.0134$ days.

Motion of System in line of sight = — 9.2 Eng. miles.

Motion in the line of sight, at time t, after deducting the motion of the system $= 56.7 \sin\left(\frac{t - t_0}{p}\, 360^\circ\right)$ Eng. miles.

A comparison with the Greenwich results for this star in preceding years was made with the aid of this formula, but it was unsatisfactory, owing to the uncertainty of the English observations.

On the assumption of a circular orbit, equal mass of the components, and the data given by observation, the mass of the system is 2.6 times that of the sun, and the distance between the components

6,260,000 miles, which assuming a parallax of 0''.2, corresponds to an angular separation of 0''.014, a quantity inappreciable in even the most powerful telescopes.

Professor VOGEL points out, finally, that traces of the spectrum of the companion can be seen on his plates, in the unsymmetrical appearance of the hydrogen line at a time of maximum motion, and the greater sharpness of other and finer lines at a time of minimum motion, and concludes that the companion, if we could see it, would be of the third magnitude.

Translating the mathematical formulæ of Professor VOGEL into the ideas which they represent, a wonderful picture of stellar motion is presented to our mind, and one to which the whole visible universe, as revealed to us by our greatest telescopes, offers no parallel. The spectacle of two great suns like our own, revolving around each other in only four days, at a distance no greater than that which separates the sixth satellite of *Saturn* from its primary, is one which the inadequacy of our optical powers will probably ever forbid us from actually beholding, but the indirect evidence that such extraordinary circumstances of motion exist, is so complete that we must admit their reality. If our knowledge of the rings of *Saturn* rested on evidence of similar character, and not on actual observation with the telescope, the facts to be accepted would seem equally strange and beyond our experience. The system of *α Virginis* offers abundant material for speculation. How great, for example, must be the tide-raising forces on the surfaces of such bodies! Actual tides would probably not be found, since it would seem as if the friction of such tides as the forces there acting would produce, would quickly bring the rotation times of both bodies into coincidence with their period of revolution; but both bodies would be distorted far out of a spherical form, and greatly elongated in the line joining their centres. If the distance of the two components were three million instead of six million miles, the bodies probably could not exist as separate masses, but would be torn to fragments by the enormous stresses. This discovery of Professor VOGEL'S, together with similar discoveries by Professor PICKERING, (which are briefly described in Publ. A. S. P. Vol. II, p. 125) opens an entirely new vista in sidereal astronomy, and will lead to wider views of the constitution of the universe. J. E. K.